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TREATMENT BY DIRECT DILATATION OF CICATRICIAL ŒSOPHAGEAL STRICTURE.

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IT is not within the intent of the paper here presented to discuss the treatment of strictures of the œsophagus due to the presence in or about the gullet wall of malignant or benign neoplasms or of those due to syphilis, tuberculosis, or œsophagismus, nor does the writer intend that his remarks shall be held to apply to the treatment of stenosis due to external causes.

It is well known that the most common, if not the most extensive, strictures of the œsophagus are those occasioned by the cicatricial contraction following the destructive action of escharotics and the trauma produced by the impaction of foreign bodies. For the first few weeks after the swallowing of a corroding fluid, which may have immediately destroyed the mucous membrane or ignited an extensive ulcerative process, the passage of an œsophageal bougie of any sort must be regarded as an undertaking attended with considerable risk.

It is questionable whether it is justifiable at such a time to attempt the introduction of any dilator. The use of the slightest force under such conditions is certainly strongly to be condemned. Following the ulcerative stage, however, the œsophageal wall undergoes certain rather constant changes which render the passage of soft bougies in careful hands less dangerous than is generally believed.

The intelligent introduction of a bougie for the treatment by dilatation of a cicatricial stricture of the œsophagus implies the previous exclusion of the possibility of the presence of aneurism, neoplasms, syphilis, tuberculosis, or abscess. That is to say, the intelligent treatment by dilatation of cicatricial stricture presupposes a correct diagnosis.

Since they premise certain more or less original theses pertaining to treatment, which the writer wishes to submit, it is for the sake of clearness desirable to review a few points relating to the pathology of cicatricial œsophageal stricture.

Concerning fibrous or organic stricture occurring as a sequence of ulceration caused by the swallowing of caustic or hot fluids, Greig Smith (Vol. i, page 465) states that "the stricture usually begins high up in the gullet and extends a considerable way downward. It is very rarely annular. The mucous membrane is replaced by a gray or bluish-gray tissue of a peculiarly hard and resistant nature. The muscular layer is rarely involved. The passage through the stricture is devious, but not to such an extent as in carcinoma."

Tillmans (*Lehrbuch der Chirurgie*) is authority for the statement that after deep destruction by caustics the œsophagus is transformed into very thick cicatricial tissue. Von Ziemssen likewise invariably found the dilated wall of the œsophagus above the cicatricial stricture much thickened.

Richardson (Dennis's "System of Surgery") says that "the muscular coats are hypertrophied in stricture of the œsophagus. This hypertrophy appears early. It is especially marked in the circular fibres, is greatest close to the stricture, and extends for some distance above it."

Cicatricial strictures are dense and unyielding. They tend to contract progressively without deep ulceration; and whereas the œsophagitis corrosiva immediately following the swallowing of an escharotic may weaken the gullet wall to a greater or less degree, with the development of scar tissue at the site of the stenosis as well as above and below the strictured segment, and with the development of muscular hypertrophy, the wall of the œsophagus in most cases becomes really tougher than in the normal state.

The presence of a diverticulum presupposes some pathologic change in the œsophageal wall (usually a hernial protrusion of the mucosa through the separated fibres of the inferior constrictor muscle). Diverticulum will hardly be expected to follow the deglutition of an escharotic unless the destructive action be great enough to lead to peri-œsophageal phlegmon. Such cases, being in nearly every instance rapidly fatal, are certainly very rarely presented to the surgeon as œsophageal strictures for treatment by dilatation or otherwise. In 100 autopsies after œsophageal stricture, Von Hacker found seven diverticula, all the result of peri-œsophageal phlegmon produced by the same traumatic agent that caused the stricture. Were diverticulum present as a complication of organic cicatricial stricture, a bougie might with little force be thrust through an area thus weakened. It is therefore fortunate that the combination of diverticulum with old cicatricial stricture is rare.

In Fig. 1 is seen an œsophagus strictured from the crossing of the bronchus almost to the cardia. The wall of the œsophagus is thickened from the cricoid cartilage to the stomach. The wall of the sacculated portion above the stenosis showed upon microscopical examination marked muscular hypertrophy. This, so far as the thickening is concerned, is a rather typical gross pathologic specimen of cicatricial stricture of the œsophagus. The danger of thrusting a flexible sound through the hypertrophied coats of this gullet would be slight, —that is, the danger of perforation incident to the passing of bougies would not be increased, but decreased, by the thickening and toughening of the œsophageal wall.

In Fig. 2 is represented a section from a normal area of the œsophagus in a case of stricture. The section shown in

Fig. 3 is taken from the œsophageal wall in the same case, near the site of stenosis. Each section is magnified eighteen diameters. It will be seen, therefore, that, owing to the muscular hypertrophy, the œsophageal wall near the stricture is twice as thick as in the normal state.

In Fig. 4 is shown a section of the same œsophageal wall at the site of stricture. The mucosa, as will be observed, has been destroyed and removed by the escharotic. This section is magnified only eleven diameters, from which it appears that the œsophagus even at the site of the stricture with the mucosa destroyed is quite twice as thick as in the normal segments. It is also somewhat toughened by the presence of scar tissue. In Fig. 5 (a section taken from the same œsophagus) may be seen large cells with large polar nuclei, Unna's plasma cells, the presence of which indicates the development of new connective tissue.

Various transitional forms of young connective-tissue cells are abundant in the submucosa above and below the site of stenosis.

To surgeons who have made gastrostomy for the relief of the distressing symptoms resulting from œsophageal stricture, the importance of persistence and patience in the attempt to accomplish the re-establishment of the œsophageal lumen by direct dilatation will be apparent. Since, in cases of cicatricial stricture, the gastrostomy is made with the view of utilizing the gastric fistula as an avenue of approach to the stricture for the practice of retrograde dilatation, it will be seen that the methods of Ssabanajew, Hahn, Frank, Witzel, and De Page, with their great advantage, so far as feeding is concerned, of providing a valve, are hardly applicable if the stricture is to be gradually dilated from below.

It would likewise be difficult to perform retrograde dilatation through the funnel-like invaginated depression in the stomach wall, after the performance of gastrostomy according to Stamm, without destroying the adhesions which make the Stamm operation efficient, that is to say, repeated stretching of the nipple-like invaginated canal would in time cause leakage.

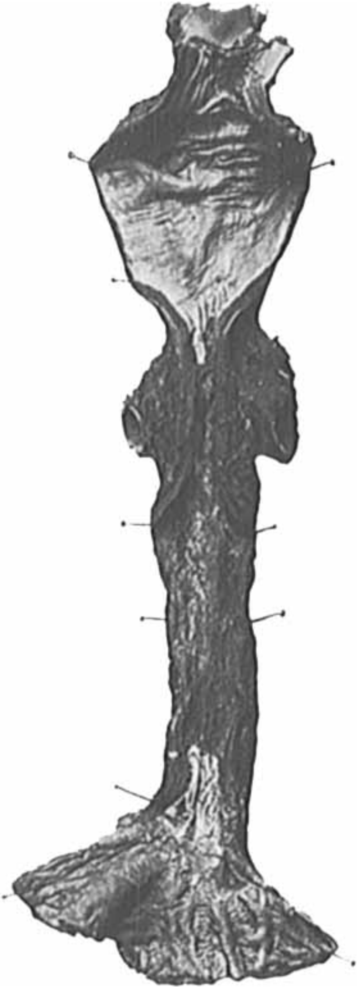


FIG. 1.—Extensive stricture of the œsophagus showing thickening of œsophageal wall throughout the whole length. The wall of the sacculated portion showing considerable thickening.

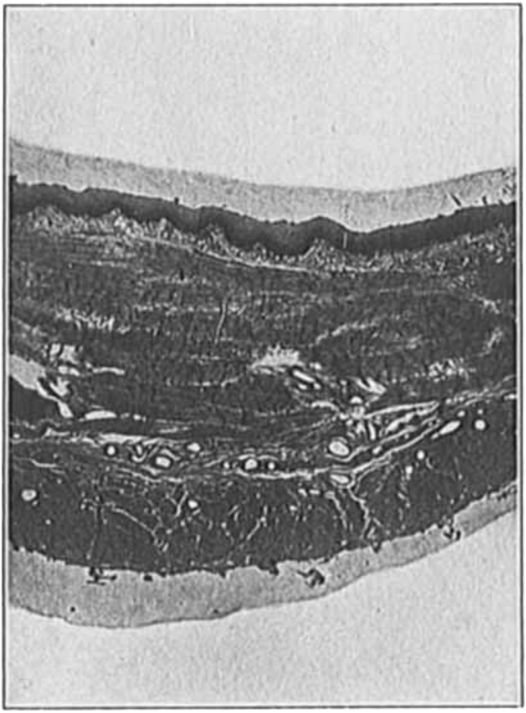


FIG. 2.—Section of normal portion of the œsophageal wall in a case of stricture. Magnified eighteen diameters.

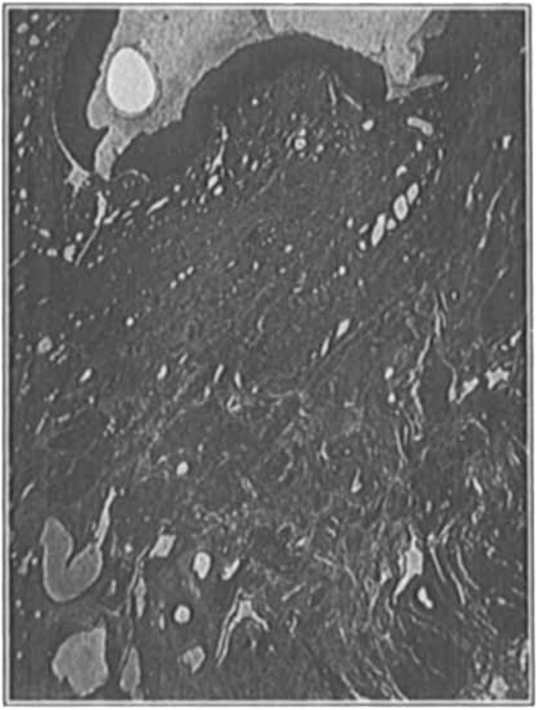


FIG. 3.—Hypertrophied wall of same œsophagus above stenosis. Magnified eighteen diameters.

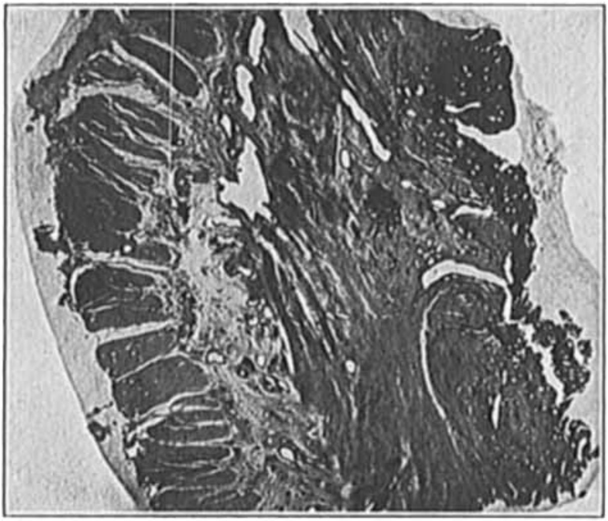


FIG. 4.—Section at site of stenosis of œsophagus shown in figure. Mucosa removed by escharotic. Magnified eleven diameters. The œsophageal wall is here markedly thickened.

If a stricture at or near the cardia can be dilated rapidly, completely, and safely at one operation, gastrostomy or gastrotomy must, it is clear, be regarded as operations distinctly preferable to direct dilatation, as they certainly must be in all cases of stricture of the œsophagus impassable by direct dilatation and in cases in which it is absolutely impossible to nourish the patient through a narrow and devious, though perhaps passable, canal in the œsophagus.

An important fact, upon which too much stress cannot be placed, is this,—gastrostomy in stricture of the œsophagus is only a palliative operation. The stricture still remains to be cured, that is, to be dilated or sawed or cut; and in the belief that, after all, direct dilatation with the attendant and consequent pressure absorption, whether induced by sounds, electrolysis, laminaria pencils, or what not, is at last our only really curative resource in stricture of the œsophagus, the writer submits for consideration photographs and descriptions of new instruments for the direct dilatation of œsophageal stricture; and, while he certainly does not wish to dogmatize upon so important a subject, submits further herewith his belief that by their use a certain percentage of so-called impassable cicatricial strictures may be entered and dilated, and the use of ordinary œsophageal bougies, laminaria pencils, and electrodes made possible.

Persistent effort with these instruments has made it possible, in several cases of what had been pronounced by surgeons of varying skill and experience to be impassable strictures, to nourish the patient and cure the stricture without gastrostomy.

It is very well known that whereas rectal alimentation and the use of a hernia pad after simple gastrostomy, as suggested by Taylor and others, may give some aid in sustaining the declining patient, it cannot be denied that a certain percentage of cases operated by simple gastrostomy for retrograde dilatation must succumb at length to starvation in spite of the most zealous efforts at maintaining nutrition, for the reason that after simple gastrostomy food cannot be easily retained in the stomach, but is expelled with each descent of the diaphragm.

In the writer's experience, gastrostomy in cases of cicatricial stricture of the œsophagus has been useful as a step towards immediate retrograde dilatation of an impassable stricture at or near the cardia, and for the establishment of a water-tight valve-closed canal through which the patient may be fed while a stricture of the upper or middle portion of the œsophagus is being opened by direct dilatation.

Gastrostomy, as a preliminary step in the application of such methods of treatment of gullet stricture as those of Ochsner and Abbe, is of course indispensable.

In children the performance of gastrostomy is not without considerable danger, and their nutrition through a gastrostomy tube is difficult.

Contrary to the experience of others, the writer has found it easier to dilate œsophageal strictures in infants and small children than in larger children and nervous and rebellious adults.

In most cases of cicatricial stricture, a gradual narrowing of the dilated segment above the stricture guides the entering bougie directly into and through the contracted lumen. It not infrequently happens, however, that cicatricial contraction so changes the relations that the lumen is not in the centre of the hypertrophied mass. Often the passage is not only narrow but devious.

The extent of strictures in the transverse and long diameter is very variable. Many include the entire periphery of the organ, but others take in only part of it. In such strictures as obstruct the lumen of the gullet with a large irregular mass presenting great dilatation or sacculation above the stenosis, or those in which the lumen is displaced from the centre of the organ, the passage of instruments, except by chance, is often impossible.

It is in the dilatation of strictures of this sort that a malleable or dirigible bougie offers a distinct advantage. (Figs. 6 and 7.) The position in the gullet of a hard-rubber olivary-bulb dilator attached to a springy whalebone shank cannot be controlled by the operator. As will be clear when

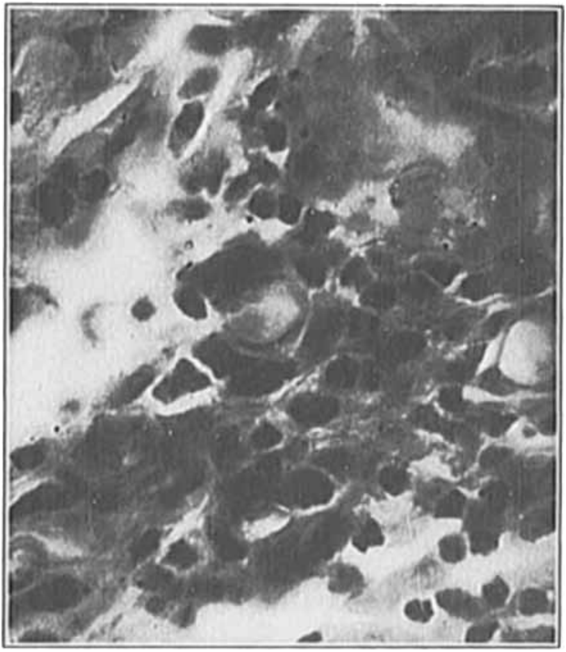
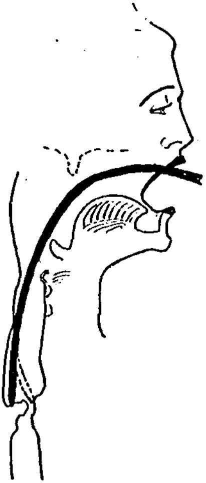


FIG. 5.—High power showing Unna's plasma cells in muscularis.

the shape and relations of the œsophagus are recalled, a bulb upon the end of a springy handle must pass along the posterior wall of the gullet in the upper segment and then across to the anterior surface as the lower extremity is approached. Cracour's spiral wire and metal-tip bougie and the English silk-web and gum dilators are open to the same objection.

FIG. 6.



Illustrating advantage of malleable bougie in stricture of the œsophagus, cicatricial contraction having displaced lumen towards anterior wall.

The surgeon occasionally encounters stricture of the œsophagus from a fold of the mucous membrane. There is such a specimen in the museum of the College of Surgeons, London.

Rokitansky (Path. Anat., Vol. ii, page 8) reported cases in which the mucosa had been destroyed by the energetic action of an escharotic and replaced by fibrous tissue, giving rise to peculiar valvular strictures of the œsophagus, somewhat analogous to those of the bowel consequent on dysentery.

It is unnecessary to multiply instances of these peculiar forms of contraction to show that in certain cases, at any rate, a malleable bougie to which one may give any desirable curve and the direction of whose tip may be controlled will serve a useful purpose. These bougies are of spiral-wound steel wire, filed flat and smooth, and contain a withdrawable soft lead core. They are made in various lengths and diameters.

If a fold of mucosa or a transverse band of scar tissue upon the posterior surface of the canal obstruct the passage of the instrument, the tip may be curved so that it must pass along the anterior surface, and *vice versa.* The core is so soft as to practically eliminate the danger of trauma to the œsophageal mucosa or perforation. The malleable core is withdrawable, and may easily be removed when the tip of the instrument has passed the stricture. The lead core makes it possible to readily determine the position of the sound while in the œsophagus by the use of the X-ray. The skiagram (Fig. 8) showing the metallic dilator occupying the œsophagus was made to determine whether the instrument really passed the stricture in this case and entered the stomach. Insomuch as it was not possible to enter the strictured segment with dilators other than one screwed to the butt of a filiform, a question arose as to whether the dilator did not merely coil up in the sacculation above the stricture. The X-ray promptly cleared up this doubt. This could hardly have been decided so easily had the dilator not been constructed of metal.

A large sound of this type may occasionally be readily passed through a strictured lumen which does not permit the entrance of very small ordinary bougies in skilful hands.

One of these instruments is shown in Fig. 9. Several filiforms, fifteen inches long, of the sort also shown upon this plate, are introduced into the œsophagus, some bent, some twisted cork-screw-like, some straight. In most cases of stricture, after to and fro and twisting manipulation of these filiforms, one after another for a longer or shorter time, one will slip through the strictured segment. The other filiforms are then withdrawn. The spiral-wound flexible metallic bougie may then in many cases be introduced by screwing its small threaded end to the threaded butt end of the filiform and push-

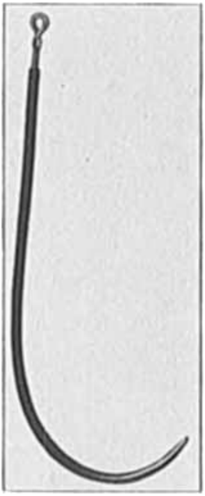


FIG. 7.—Soft malleable œsophageal bougie of web-silk containing withdrawable lead core.

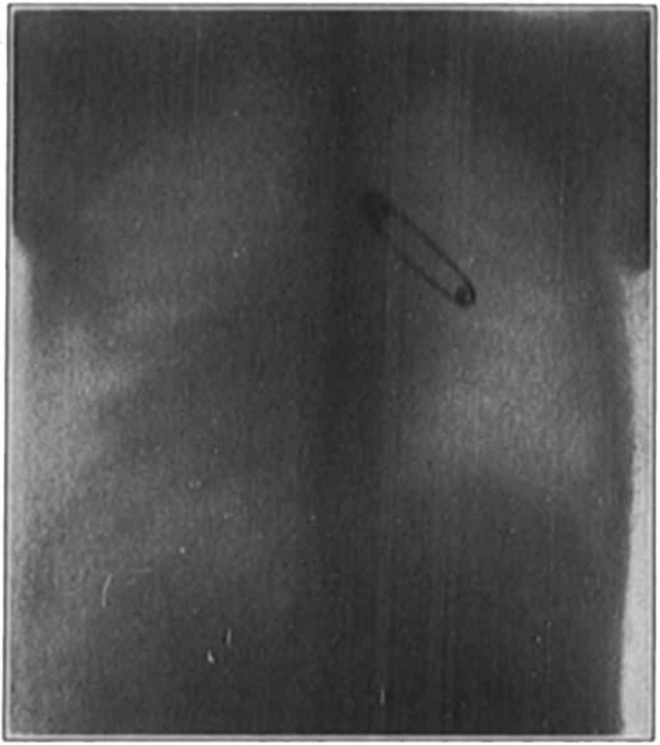


Fig. 8.—Skiagraph showing author's spiral-wound-wire dilator in strictured œsophagus (attached to filiform guide). The picture is taken from the back, therefore shows liver upon the right side. The normal curves of the œsophagus are described by the bougie.

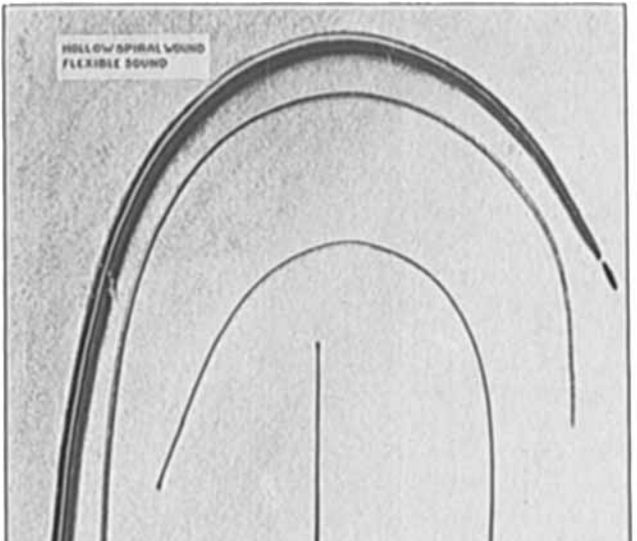


FIG. 9.—Wound wire malleable bougie and whale-bone guides.

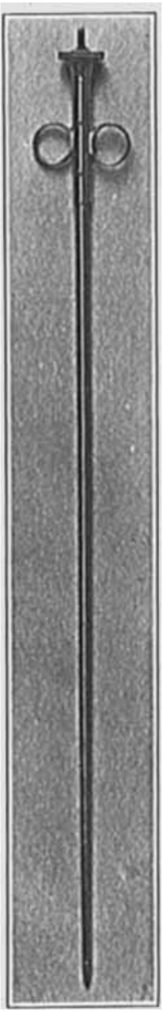


Fig. 10.—Flexible dirigible metallic œsophageal bougie.

ing it gently into the œsophagus with or without the lead core, according to the resistance offered by the stricture. The filiforms, being soft and flexible, curl up in the stomach with no trauma to the gastric mucosa.

The writer is at present dilating a valve-like stricture of the œsophagus in a boy two years of age, in which after months of regular dilatation it is not possible to introduce any other instrument than one of the kind just described. In this case, after manipulation of the filiforms for a few minutes, one can always be made to engage the stricture and pass readily into the stomach. A relatively large-sized metallic bougie attached to the butt end of the filiform will readily follow the latter through the œsophagus, the filiform curling up in the stomach.

The shorter and stiffer filiform point shown in Fig. 9 has been successfully used to guide the metallic dilator through a tight stricture at the level of the diaphragm. In this case a gastrostomy and unsuccessful attempt at rapid retrograde dilatation had been made. Under gradual direct dilatation, this stricture is yielding. The patient swallows readily fluids and semisolids after three months of sounding. In Fig. 9 is shown a short hard-rubber tip which may be screwed to the threaded hollow end of the metallic bougie when the latter is to be used as an ordinary sound. To render the instrument malleable, the lead-wire core is introduced.

The writer has also fashioned a dirigible sound (Fig. 10), the distal end and tip of which may be moved at will, while the instrument lies in the œsophagus, by the manipulation of an adjustment screw at the proximal extremity. This is made of two tapering bands of watch-spring steel welded together at the distal extremity or point. They are covered by flat wound wire. One of these bands is fixed to the handle of the instrument near the adjustment screw, the other band is attached to a half and full-round threaded bar which passes through the screw. By manipulation of the adjustment screw, the second band can be made to slide along the first, forward or backward, so as to move the tip in either of two directions. With this instrument, which is light and quite flexible, it is possible to explore the bottom of a sacculation and enter an œsophageal lumen which would otherwise be difficult to discover.

Bulbous sounds for the œsophagus are open to such objections as apply to bulbous sounds generally. Like the urethral "bougie-à-boule," they are useful in locating strictures, but are of little value as dilators. It is almost impossible to cause a bulb to lie in the grasp of a small stricture. It may be brought without difficulty to the proximal margin, and may be pushed to the distal side, but is only with great difficulty held in the contracted segment. It is not easy to secure with them the absorption produced by continued gentle pressure.

The swallowing of weak cocaine or adrenalin solution will usually, by virtue of the vascular depletion produced by those agents, facilitate the introduction of any œsophageal sound. The cocaine solution will also in most cases relieve nausea and prevent spasmodic and violent reversed peristaltic efforts, which may render the passage of instruments wellnigh impossible in an otherwise passable stricture. The local anæsthesia is also, for obvious reasons, of considerable value, especially in children.

We are generally advised to incline the head of the patient backward before introducing a sound. The writer has found it distinctly advantageous to enter the œsophagus with the head tilted forward. The tissues of the neck are more relaxed in the latter position.

Not all of the varieties of œsophageal stricture may be successfully treated by dilatation; yet it is doubtful whether the sound is not useful at some time in every case of cicatricial stricture.